DESIGNING AND FABRICATING THE PUNCH CHUCK AND PRECISION HOLE PUNCH DIAMETER 3.0MM, 3.5MM AND 4.0MM FOR TURRET PUNCH MACHINE

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A report submitted in fulfillment of the
requirement for the award of the
Diploma of Mechanical Engineering

Faculty of Mechanical Engineering
University Malaysia Pahang

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I hereby declare that I have read this project report and in my opinion this project report is sufficient in terms of scope and quality for the award of the Diploma in Mechanical Engineering

Signature : ……

Name of Supervisor : Mr.Hazami Bin Che Hussain

Date : November 2008

I declare that this report entitled "*Designing and Fabricating The Punch Chuck And Precision Hole Punch Diameter 3.0mm, 3.5mm And 4.0mm For Turret Punch Machine*" is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : ……..

Name : Prabagar a/l Murukesavan

Date : November 2008

DEDICATION

This report is dedicated to God whose guidance, help and grace was instrumental in making this humble work a reality. To my beloved father and mother, Mr.Murukesavan Thannimalai and Mrs.Bathmavathi Rengasamy and my respected supervisor, Mr.Hazami Bin Che Hussain..

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ABSTRACT

Design and fabricating the punch chuck and precision hole punch 3.0mm, 3.5mm and 4.0mm is a conceptual understanding of manufacturing engineering which is not provided in daily lectures room due to the fact that it is advance knowledge in this field. The project is to test and analyze the percentage of failure of punch tool fabricated using mild steel during punching process. As such, it is vital to attain this basic knowledge through this project. The purpose of this project is to design and fabricate the punch chuck and precision hole punch 3.0mm, 3.5mm and 4.0mm. The design must follow the dimensions of the original punch tool so that it could be mounted into the machine. A material test should be done to determine the hardness of mild steel before fabrication. The progress of this project needs documenting, as it can be a good reference for the next student who involve in this project as well as for a research related to the punch tool. This report describes the project development of the first prototype of punch chuck and precision hole punch fabricated using mild steel material.

ABSTRAK

Tujuan utama projek ini adalah untuk mereka dan membuat sebuah pemegang penebuk dan penebuk bersaiz 3mm, 3.5mm dan 4mm. Konsep projek ini adalah amat sukar difahami, dan jarang diberi perhatian ketika dalam kuliah maka projek ini member ilmu yang lebih mendalam tentang projek ini. Projek ini adalah untuk menguji dan menganalisa keupayaan penebuk yang diperbuat daripada besi tuang semasa proses menebuk.Spesifikasi penebuk hendaklah mengikut spesifikasi asal supaya boleh dimuatkan ke dalam mesin. Jenis bahan yang digunakan sebelum proses fabrikasi haruslah diuji kekerasannya. Projek ini memerlukan dokumentasi yang baik kerana ia boleh menjadi panduan kepada pelajar-pelajar selepas ini dan juga kajian berkaitan dengan tajuk ini. Laporan ini menunjukkan projek pertama UMP berkaitan dengan pemegang penebuk dan penebuk bersaiz 3mm, 3.5mm dan 4mm yang diperbuat daripada besi tuang.

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SYMBOL	NAME
kN	Kilo Newton
º	Degree
in	Inches
%	Percentage
kg/m^3	Kilogram per meter cube
lb/in^3	Pound per inches cube
MPa	Mega Pascal
Gpa	Giga Pascal
psi	Pound per square inch
mm	Millimeter
Ø	Diameter
rpm	Revolution per Minute

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

As a mechanical engineering student of University Malaysia Pahang (UMP), the final year project gives student a chance to practice all the knowledge and skills that they gain along the academic session in solving problems through a project in order to be an efficient and a good engineer.

1.1. Project Synopsis

This project involves designing and fabricating a punch chuck and precision hole punch. As the Diploma final year project allocates the duration of one semester, this project requires significant number of machining processes such as facing, turning and surface finishing. Basically the main processes that are involved in this project is the fabrication of the turret machine punch chuck and precision hole punch using a lathe machine combining different kinds of cutting process. This project is designed to be compatible with the Trumpf CNC Turret Machine.

1.2. Problem Statement

The CNC Turret Machine is a machine used to process sheet metals using different types of punch tools. The punch chuck and tools are specially made and imported from Trumpf Manufacturers from Germany. Because of frequent use and low maintenance of the punch chuck and tools, the products tend to fail after a certain period of time. After this happens, it takes an amount of time to get approval from higher authorities to purchase a new tool and delay from the suppliers.

This project is purposed to find an alternative tool which is easy to fabricate and using materials which are easily found.

1.3. Scope of Work

In order to finish this project, it requires precise scope of work and proper plan need to be followed because this project must go through various processes before it can be produced. Beside that this project title is a new idea which is from an instructor engineer in lab and as the knowledge isn't entirely covered in classes or lab. So it give us advantages to learn new process to produce this product and absolutely we could find lot of advantages neither we are realized or not. These are scope of work in this project,

These scopes help me to be focused and know about my job. The scopes are:

a) Literature review on punch chuck and precision hole punch
b) Design a punch chuck and precision hole punch using Computer Aided Design (SolidWorks)
c) Test the hardness of mild steel using Rockwell hardness test.
d) Fabricate the punch chuck and precision hole punch from mild steel material using Conventional Lathe Machine.
e) Fit and test run the fabricated tool at the CNC Turret Punch Machine.

The punch tool can be used to punch aluminium sheet metals for thickness less than 1mm.It is time where the soft skill e.g. punctuality, self discipline, time management and problem solving have been practiced because the project highly depend on the effectiveness of all the skill as much as the knowledge we have learnt.

1.4. Objective of Project

i) The main objective of Designing and Fabricating The Punch Chuck And Precision Hole Punch Diameter 3.0mm, 3.5mm And 4.0mm For Turret Punch Machine is to fabricate the alternative Punch Chuck and Precision Hole Punch using mild steel material.

ii) The other objectives of this project is to analyze whether the mild steel material made tool can withstand the turret machine punch force and to determine the percentage of failure using the mild steel made tool on sheet metals such as aluminium of thickness less than 1mm..

1.5. Project Planning

Based on the Gantt chart in Table 1.1, the confirmation of project title was done on Week 1.This project begun with a research and literature review made via internet, catalogs, supervisor, and others relevant academic material that related to the title, this literature review was done on week 2. This continues along the way of this project because there is a lot of knowledge to be learned.

At the same week, some schedule management for this project which included schedule management for the project. This is done by using Microsoft Excel Project using Gantt chart system.

Supervisor gave briefing about the introduction of the project and the usage of the punch chuck and precision hole punch.

The sketching of the model takes about 1 week to be done and done on week 4. The sketching done using manual sketched at A4 size paper and the engineering drawing is done using Solid Work software. This was done from week 5 to week 7. The design of the sketching are deeply discussed and the best design that suits is selected. The design also must be suitable for the Trumpf CNC Turret Machine.

The next task is preparation of progress presentation of the project. In this particular week, the student receives aids from the supervisor about the presentation. The preparation of the presentation requires comments and correction from the supervisor.

On week 8, which is the material testing week where different types of materials are tested for their hardness properties using Rockwell Hardness Tester and the hardness are compared. Then, the material suitable for punching thin sheet metals is chosen.

Next is the fabrication process. The punch chuck and precision hole punch is fabricated using Conventional Lathe machine. The knowledge of manufacturing process is applicable here. This task scheduled to take time about eight weeks and is done from week 8 to week 15.

Finally, the surface finishing process using sandpaper is done. To achieve and analyze the percentage of failure of this tool, it is tested on the Trumpf CNC Turret Machine.

Next task is the final report writing and final presentation preparation. This take about one week to accomplished which is week 16. The report is done with the supervisor's guidance. All the task is scheduled to take about sixteen weeks overall.

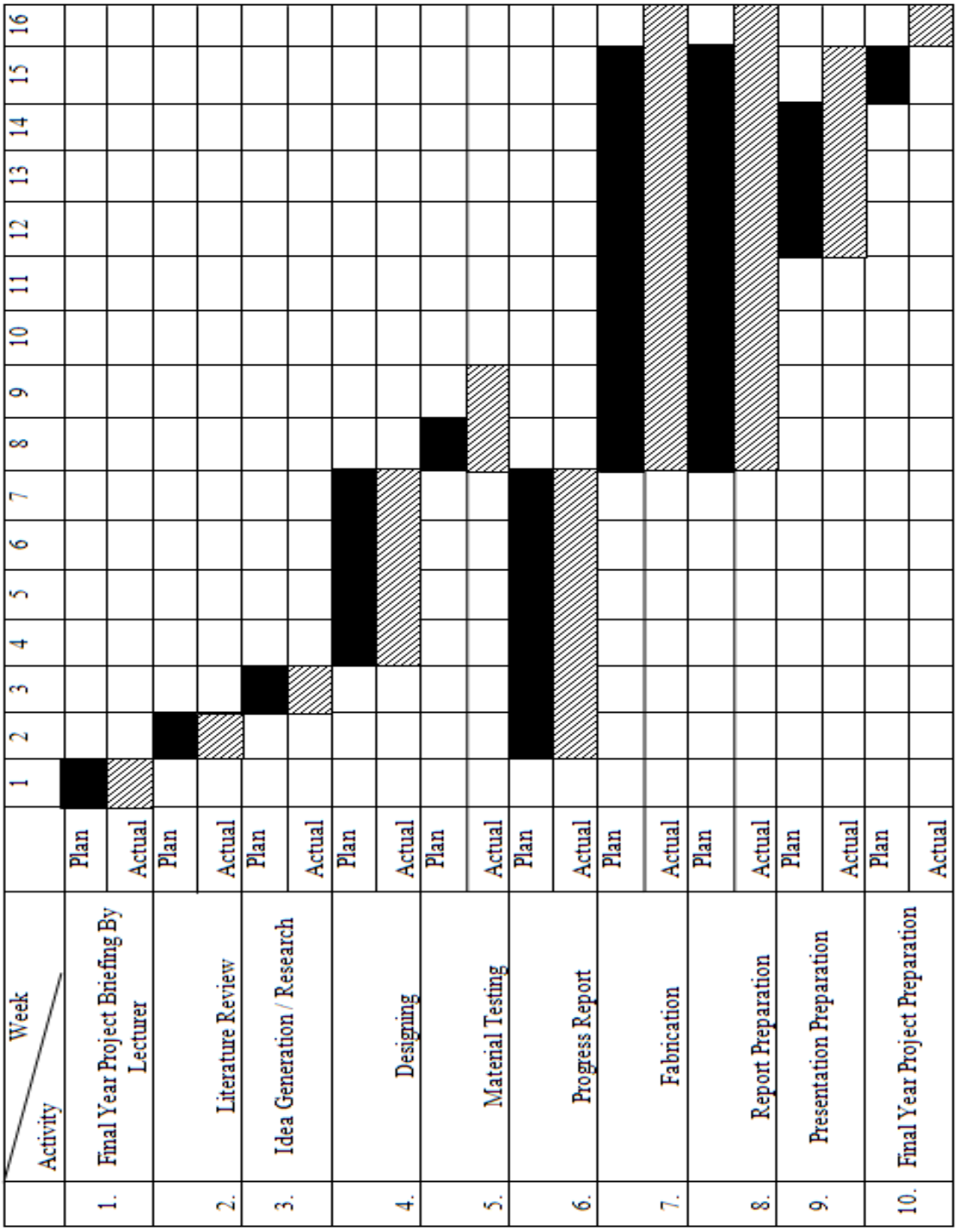

Table 1.1: Gantt Chart of the project

CHAPTER 2

LITERATURE REVIEW

The title design and fabrication of a Punch chuck and Precision Hole Punch requires an amount of good understanding on the knowledge of the CNC Turret Punch Machine. Therefore, executing a research is necessary to obtain all the information available and related to this topic. The information or literature reviews obtained are essentially valuable to assist in the fabrication and specification of this final year project. With this grounds established, the project can proceed with guidance and assertiveness in achieving the target mark.

2.0. Introduction

The machine used in FKM lab is the Trumatic 2020R FMC model from Trumpf Company. Trumatic 2020R FMC is a high-precision coordinate-holing sheet-processing center with numerical program control. It has: high speed of cutting-out and a hydraulic cutting head with 360° rotation as well as an easy-to-use linear tool buffer. A professional in the field of cutting produces parts without scratches and with high accuracy and uniformity. It is manufactured in the year 2005 in Germany. The maximum punch capacity of this machine is 180kN. The tools associated with this machine are usually made from High Speed Steel (HSS) material and from Trumpf Company.

2.1. Terminology

2.1.1. Turret Punch Machine

Turret Punch is widely phrased as CNC Turret Punch Press and commonly known as NCT or punch machine, is a numerical controlled plate processing machine. Diagrams are transformed into CNC programmes through programming or CAD/CAM software can finish the processed items in short time no matter how complicated the plated item is. It is a lot more efficient than the traditional punch machine which requires moulding process. It is also used for bending, punching and forming sheet metals.

Figure 2.1: Turret Punch Machine

2.1.2. Sheet Metal

Sheet metal is simply metal formed into thin and flat pieces. It is one of the fundamental forms used in metalworking, and can be cut and bent into a variety of different shapes. Countless everyday objects are constructed of the material. Thicknesses can vary significantly, although extremely thin thicknesses are considered foil or leaf, and pieces thicker than 6mm (0.25in) are considered plate.

Sheet metal is available as flat pieces or as a coiled strip. The coils are formed by running a continuous sheet of metal through a roll slitter. The thickness of the sheet metal is called its gauge. The gauge of sheet metal ranges from 30 gauge to about 8 gauge. The higher the gauge, the thinner the metal is.

2.1.3. Punching

Punching is performed by moving the sheet metal between the top and bottom tools of a punch. The top tool (punch) mates with the bottom tool (die), cutting a simple shape (e.g. a square, circle, or hexagon) from the sheet. An area can be cut out by making several hundred small square cuts around the perimeter. A punch is less flexible than a laser for cutting compound shapes, but faster for repetitive shapes. A typical CNC punch has a choice of up to 60 tools in a ‘turret’ that can be rotated to bring any tool to the active punching position. A modern CNC punch can take 600 blows per minute.

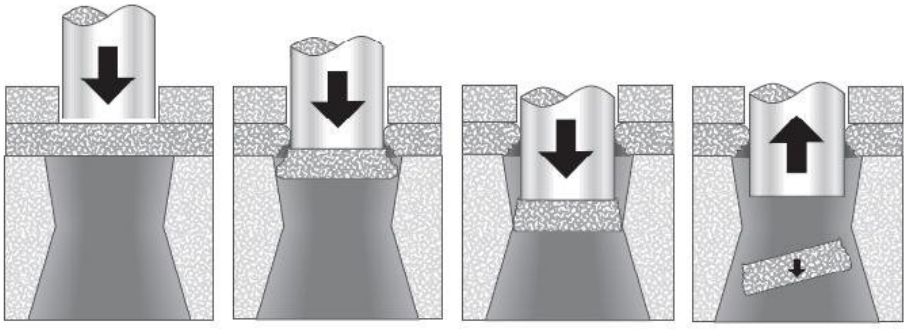

Figure 2.2: Punching Process